Study plan

Name of study plan: Medical electronics and bioinformatics

Faculty/Institute/Others: Faculty of Electrical Engineering

Department:

Branch of study guaranteed by the department: Welcome page

Garantor of the study branch:

Program of study: Medical Electronics and Bioinformatics

Type of study: Follow-up master full-time

Required credits: 114
Elective courses credits: 6
Sum of credits in the plan: 120

Note on the plan: Specializace Zpracování signál

Name of the block: Compulsory courses in the program

Minimal number of credits of the block: 60

The role of the block: P

Code of the group: 2018_MBIODIP Name of the group: Diploma Thesis

Requirement credits in the group: In this group you have to gain 30 credits Requirement courses in the group: In this group you have to complete 1 course

Credits in the group: 30 Note on the group:

| Code | Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.) | Completion | Credits | Scope | Semester | Role |
|--------|---|------------|---------|-------|----------|------|
| BDIP30 | Diploma Thesis | Z | 30 | 22s | L | Р |

Characteristics of the courses of this group of Study Plan: Code=2018_MBIODIP Name=Diploma Thesis

| BDIP30 | Diploma Thesis | Z | 30 |
|------------------------|--|----------------------|------------------|
| Independent final com | prehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his | or her branch of s | tudy, which will |
| he enseified by brench | department or branch departments. The diplome thesis will be defended in front of the board of examinars for the comprehen | onive final everning | otion |

Code of the group: 2018_MBIOP

Name of the group: Compulsory subjects of the programme

Requirement credits in the group: In this group you have to gain 30 credits

Requirement courses in the group: In this group you have to complete 5 courses

Credits in the group: 30

Note on the group:

| Code | Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.) | Completion | Credits | Scope | Semester | Role |
|----------|---|------------|---------|-------|----------|------|
| BAM31BSG | Biological signals Roman mejla Roman mejla (Gar.) | Z,ZK | 6 | 2P+2L | L | Р |
| BMPROJ6 | Diploma Project Roman mejla, Jan Kybic, Vratislav Fabián, Petr Pošík Petr Pošík Roman mejla (Gar.) | Z | 6 | 0p+6s | Z,L | Р |
| BAM31LET | Medical Instrumentation and Devices Jan Havlík Jan Havlík (Gar.) | Z,ZK | 6 | 2P+2L | Z | Р |
| B4M36SAN | Statistical Data Analysis Ji í Kléma Ji í Kléma Ji í Kléma (Gar.) | Z,ZK | 6 | 2P+2C | Z | Р |
| BAM33ZSL | Medical Imaging Systems Jan Kybic, Vít Herynek, André Sopczak Jan Kybic Jan Kybic (Gar.) | Z,ZK | 6 | 2P+2C | L | Р |

Characteristics of the courses of this group of Study Plan: Code=2018 MBIOP Name=Compulsory subjects of the programme

| | | | <u> </u> | | | | |
|----------|--------------------|--|--------------|--|------|------|---|
| BAM31BSG | Biological signals | | | | | Z,ZK | 6 |
| BMPROJ6 | Diploma Project | | | | | Z | 6 |

BAM31LET Medical Instrumentation and Devices

Students will study fundamental principles applied within the modern medical devices and systems, esp. from the point of view of functional blocks and electronic circuits of diagnostical and therapeutical medical equipments including electrocardiographs, electroencephalographs, bedside and central monitors, equipments for anestesiology, intensive and critical healthcare, equipments for clinical laboratory, electrostimulators, cardiostimulators and defibrilators, blood pressure and flow measurement (including dilution) and pulse oxymetry.

Statistical Data Analysis

This course builds on the skills developed in introductory statistics courses. It is practically oriented and gives an introduction to applied statistics. It mainly aims at multivariate statistical analysis and modelling, i.e., the methods that help to understand, interpret, visualize and model potentially high-dimensional data. It can be seen as a purely statistical counterpart to machine learning and data mining courses.

Medical Imaging Systems

The course covers the principles, design and properties of currently used medical imaging devices. We shall deal with 2D microscopic, X-ray and ultrasound imaging systems, including advanced topics such as Doppler ultrasound. We will also study tomographic (3D) imaging systems: computed tomography (CT), magnetic resonance imaging (MRI) including functional MRI (fMRI) and nuclear imaging methods (PET,SPECT). For more information see https://cw.fel.cvut.cz/wiki/courses/zsl

Name of the block: Compulsory courses in the specialization

Minimal number of credits of the block: 30

The role of the block: PS

Code of the group: 2018 MBIOPS4

Name of the group: Compulsory subjects of specialization

Requirement credits in the group: In this group you have to gain 30 credits

Requirement courses in the group: In this group you have to complete 5 courses

Credits in the group: 30 Note on the group:

| Code | Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.) | Completion | Credits | Scope | Semester | Role |
|----------|---|------------|---------|-------|----------|------|
| BAM31ADA | Adaptive signal processing Radoslav Bortel, Pavel Sovka Radoslav Bortel (Gar.) | Z,ZK | 6 | 2P+2C | Z | PS |
| BAM31MOA | Modeling and analysis of brain activity Jaroslav Hlinka Jaroslav Hlinka (Gar.) | Z,ZK | 6 | 2P+2C | Z | PS |
| BAM31NPG | Neurophysiology P emysl Jiruška, Helena Pivo ková P emysl Jiruška P emysl Jiruška (Gar.) | Z,ZK | 6 | 2P+2C | Z | PS |
| B2M31DSP | Advanced DSP methods Pavel Sovka, Petr Pollák Pavel Sovka Pavel Sovka (Gar.) | Z,ZK | 6 | 2P+2C | Z,L | PS |
| BAM31ZAS | Analog Signal Processing Ji i Hospodka Ji i Hospodka Ji i Hospodka (Gar.) | Z,ZK | 6 | 2P+2L | L | PS |

Characteristics of the courses of this group of Study Plan: Code=2018_MBIOPS4 Name=Compulsory subjects of specialization

| BAM31ADA | Adaptive signal processing | Z,ZK | 6 |
|------------------------|--|------|---|
| This course provides a | basic discourse on adaptive algorithms for filtering, decorrelation, separation and beamforming. | , | 1 |
| BAM31MOA | Modeling and analysis of brain activity | Z,ZK | 6 |
| BAM31NPG | Neurophysiology | Z,ZK | 6 |
| B2M31DSP | Advanced DSP methods | Z,ZK | 6 |

The course follows the basic course in signal processing and introduces advanced methods of analysis and digital signal processing. Graduates will learn the methods of digital signals analysis and be able to practically use them. They learn to know the conditions of use of correlation, spectral and coherent analysis of random signals. They will became familiar with methods of signal decomposition and independent component analysis and the time-frequency transformations. Emphasis will be placed on an ability to interpret the results of signal analyses

BAM31ZAS Analog Signal Processing

The course deals with analog input-output blocks for signal transmission and processing. They discussed circuit solution of amplifiers and filters, including their design process, simulation and measurement. Students learn the circuit concepts and possibilities for solving the contemporary analogue structures. The second part of the course describes the design and implementation of analog filters, including discrete-time circuits. The conclusion is devoted to the possibilities of computer optimization of electronic circuits and filters.

Name of the block: Compulsory elective courses

Minimal number of credits of the block: 24

The role of the block: PV

Code of the group: 2018_MBIOPPV4

Name of the group: Compulsory subjects of the programme

Requirement credits in the group: In this group you have to gain 24 credits

Requirement courses in the group: In this group you have to complete 4 courses

Credits in the group: 24

Note on the group:

| Code | Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.) | Completion | Credits | Scope | Semester | Role |
|-----------|--|------------|---------|----------|----------|------|
| B2M31AEDA | Experimental Data Analysis Jan Rusz Jan Rusz Jan Rusz (Gar.) | Z,ZK | 6 | 2P+2C | Z | PV |
| BAM17EPM | Applications of Electromagnetic Fields in Medicine Jan Vrba, Ladislav Oppl Jan Vrba Jan Vrba (Gar.) | Z,ZK | 6 | 2P+2L | L | PV |
| BAM31AOL | Applied optoelectronics in medicine Jan Havlík Jan Havlík (Gar.) | Z,ZK | 6 | 2P+2L | L | PV |
| BAM36BIN | Bioinformatics Jií Kléma Jií Kléma Jií Kléma (Gar.) | Z,ZK | 6 | 2P+2C | L | PV |
| BAM02BIO | Biosensors Bohuslav Rezek Bohuslav Rezek Bohuslav Rezek (Gar.) | Z,ZK | 6 | 2P+2L | Z | PV |
| BAM02FPT | Physics for Diagnostics and Therapy Vratislav Fabián, Jan Vrba, Ladislav Oppl Vratislav Fabián Vratislav Fabián (Gar.) | Z,ZK | 6 | 2P+2L | | PV |
| B0M37FAV | Physiology and modeling of hearing and vision Miloš Klíma, Václav Vencovský, Petr Maršálek, Karel Fliegel Karel Fliegel Václav Vencovský (Gar.) | Z,ZK | 6 | 2P+2C+4C | Z | PV |
| B4M35KO | Combinatorial Optimization Zden k Hanzálek Zden k Hanzálek (Gar.) | Z,ZK | 6 | 3P+2C | L | PV |
| BAM38KLS | Construction of Medical Systems Jan Holub Jan Holub (Gar.) | Z,ZK | 6 | 2P+2L | Z | PV |
| B4M33MPV | Computer Vision Methods Georgios Tolias, Ji í Matas, Jan ech, Dmytro Mishkin Ond ej Drbohlav Ji í Matas (Gar.) | Z,ZK | 6 | 2P+2C | L | PV |
| B4M36MBG | Molecular Biology and Genetics Martin Pospíšek Martin Pospíšek Martin Pospíšek (Gar.) | Z,ZK | 6 | 3P+1C | L | PV |
| BAM33NIN | Neuroinformatics Giulia D'Angelo, Ji í Hammer, Daniel Novák, Eduard Bakštein, Karla Št pánová, Ján Antolík, David Kala Daniel Novák Daniel Novák (Gar.) | Z,ZK | 6 | 2P+2C | L | PV |
| B4M33PAL | Advanced algorithms Marko Genyk-Berezovskyj, Daniel Pr ša, Ond ej Drbohlav Daniel Pr ša Daniel Pr ša (Gar.) | Z,ZK | 6 | 2P+2C | Z | PV |
| BE4M33SSU | Statistical Machine Learning Jan Drchal, Vojt ch Franc Vojt ch Franc Vojt ch Franc (Gar.) | Z,ZK | 6 | 2P+2C | Z | PV |
| B4M36SMU | Symbolic Machine Learning Filip Železný, Ond ej Kuželka, Gustav Šír Ond ej Kuželka Ond ej Kuželka (Gar.) | Z,ZK | 6 | 2P+2C | L | PV |
| BAM17EMC | Introduction to electromagnetic compatibility Tomáš Ko ínek Tomáš Ko ínek Tomáš Ko ínek (Gar.) | Z,ZK | 6 | 2P+2L | Z | PV |
| BAM33ZMO | Medical Image Processing Jan Kybic, Oleksandr Shekhovtsov Jan Kybic Jan Kybic (Gar.) | Z,ZK | 6 | 2P+2C | Z | PV |

Characteristics of the courses of this group of Study Plan: Code=2018_MBIOPPV4 Name=Compulsory subjects of the programme

B2M31AEDA Experimental Data Analysis

Z,ZK

6

In the course of subject "Experimental Data Analysis", students will acquire knowledge regarding fundamental methods for data analysis and machine learning for evaluation and interpretation of data. In the course of practical lectures, students will solve individual tasks using real data from signal processing in neuroscience research. In the course of semestral project, student will solve complex task and present obtained results. The aim of the subject is to introduce practical application of fundamental statistical methods as well as to teach students to use critical thinking and to acquire additional knowledge in solution of practical tasks.

BAM17EPM Applications of Electromagnetic Fields in Medicine

Z.ZK

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The major aim of these lectures is to give to students a basic overview of biophysical aspects of EM fields in different biological systems, including an overview of microwave applications in medicine. Safety limits, clinical usage of EM field effects on biological systems, microwave hyperthermia, measurement of dielectric parameters of biological tissues, EM exposure of mobile phone users, magnetic resonance imaging, interaction of optical radiation with biological tissue.

| BAM31AOL | Applied optoelectronics in medicine | Z,ZK | 6 |
|----------|-------------------------------------|------|---|
| BAM36BIN | Bioinformatics | Z,ZK | 6 |
| BAM02BIO | Biosensors | Z,ZK | 6 |
| BAM02FPT | Physics for Diagnostics and Therapy | 7 7K | 6 |

In this course, students will be introduced to the problems of locomotive organs diseases and musculoskeletal pain in the first seven lectures. Great space is devoted to electrotherapeutic methods, therapeutic ultrasound and phototherapy. Furthermore, advanced neurorehabilitation methods, especially transcranial brain stimulation methods (repetitive transcranial magnetic stimulation of the brain - rTMS, transcranial electrical stimulation of the brain - tDCS and electroconvulsive therapy - ECT) are discussed. In the second half of the semester, attention is paid to the possibilities of using ionizing electromagnetic fields in medical diagnostics and therapy (eg X-ray, proton therapy, radiotherapy, etc.).

B0M37FAV Physiology and modeling of hearing and vision

Z,ZK

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The primary aim of the course is to study the physiology of sensors and processes of perception of audio and visual information by human subjects as two central and most important communication channels, i.e., Human Auditory System (HAS) and Human Visual System (HVS). The course summarizes current knowledge in the field of human vision and hearing physiology and, at the same time, presents their description using mathematical models using the latest computational tools and procedures, including Machine Learning (ML), Deep Learning (DL) and Artificial Intelligence (AI). Emphasis is also placed on current and prospective applications of the mentioned knowledge. The main application area is the audiovisual technology related to human perception, but the direct employment of the acquired knowledge also includes the areas of multimedia technology, control systems, automation, robotics, safety and security technology, bioinspired systems, etc. At the same time, students gain a general overview of information processing in biological systems. A separate part is the objectification of audiovisual information perceived quality, i.e., Quality of Experience (QoE). The course is intended for students of master's degree in technical fields. The exercises will be devoted to fundamental experiments to determine the most important characteristics of HAS and HVS, including computational models and simulation of vision and hearing processes.

| B4M35KO | Combinatorial Optimization | Z,ZK | 6 |
|-------------------------|--|---------------------------|------------------|
| The goal is to show th | e problems and algorithms of combinatorial optimization (often called discrete optimization; there is a strong overlap with the tei | rm operations rese | arch). Following |
| | algebra, graph theory, and basics of optimization, we show optimization techniques based on graphs, integer linear programm | • | |
| algorithms and state | space search methods. We focus on application of optimization in stores, ground transportation, flight transportation, logistics, | planning of human | resources, |
| scheduling in product | ion lines, message routing, scheduling in parallel computers. | | |
| BAM38KLS | Construction of Medical Systems | Z,ZK | 6 |
| B4M33MPV | Computer Vision Methods | Z,ZK | 6 |
| The course covers se | lected computer vision problems: search for correspondences between images via interest point detection, description and ma | atching, image stitc | hing, detection, |
| recognition and segm | entation of objects in images and videos, image retrieval from large databases and tracking of objects in video sequences. Thi | s course is also pa | rt of the |
| , , , | Imme prg.ai Minor. It pools the best of AI education in Prague to provide students with a deeper and broader insight into the fie le at https://prg.ai/minor. | eld of artificial intelli | igence. More |
| B4M36MBG | Molecular Biology and Genetics | Z,ZK | 6 |
| BAM33NIN | Neuroinformatics | Z,ZK | 6 |
| The Neuroinformatics | Course concentrates on modelling of neurons, stochastic learning on cellular level, information coding and decoding in brain an | d single unit proces | ssing. Examples |
| from clinical practices | are provided throughout the course. The labs focus on signal neuron analysis from human and animal brain. | | |
| B4M33PAL | Advanced algorithms | Z,ZK | 6 |
| Basic graph algorithm | is and graph representation. Combinatorial algorithms. Application of formal languages theory in computer science - pattern m | atching. | |
| BE4M33SSU | Statistical Machine Learning | Z,ZK | 6 |
| The aim of statistical | machine learning is to develop systems (models and algorithms) for learning to solve tasks given a set of examples and some | prior knowledge al | oout the task. |
| This includes typical | asks in speech and image recognition. The course has the following two main objectives 1. to present fundamental learning co | ncepts such as ris | k minimisation, |
| maximum likelihood e | stimation and Bayesian learning including their theoretical aspects, 2. to consider important state-of-the-art models for classific | cation and regressi | on and to show |
| how they can be learn | ned by those concepts. | | |
| B4M36SMU | Symbolic Machine Learning | Z,ZK | 6 |
| This course consists | of four parts. The first part of the course will explain methods through which an intelligent agent can learn by interacting with its | environment, also | known as |
| reinforcement learnin | g. This will include deep reinforcement learning. The second part focuses on Bayesian networks, specifically methods for infere | ence. The third part | will cover |
| fundamental topics fr | om natural language learning, starting from the basics and ending with state-of-the-art architectures such as transformer. Final | lly, the last part will | provide an |
| introduction to severa | I topics from the computational learning theory, including the online and batch learning settings. | | |
| BAM17EMC | Introduction to electromagnetic compatibility | Z,ZK | 6 |
| The subject dwells or | problems of electromagnetic compatibility. Students obtain the basic knowledges in the field of electromagnetic compatibility - | electromagnetic ir | nterference, |
| suscentibility and test | ing methods. The subject leads to gain professional skills in the field of electrical engineering | | |

susceptibility and testing methods. The subject leads to gain professional skills in the field of electrical engineering. Z,ZK

Medical Image Processing

This course covers the most used advanced image analysis methods, with emphasis on images from medical and biological modalities, from microscopy, to ultrasound, MRI, or CT, including time sequences.

Name of the block: Elective courses Minimal number of credits of the block: 0

The role of the block: V

Code of the group: 2018_MBIOH

Name of the group: Humanities subjects

Requirement credits in the group: Requirement courses in the group:

Credits in the group: 0

Note on the group.

| Note on the gr | oup. | | | | | |
|----------------|---|------------|---------|-------|----------|------|
| Code | Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.) | Completion | Credits | Scope | Semester | Role |
| B0M16FIL | Peter Zamarovský Peter Zamarovský Peter Zamarovský (Gar.) | Z,ZK | 5 | 2P+2S | Z,L | V |
| B0M16HVT | History of science and technology 2 Marcela Efmertová, Jan Mikeš Marcela Efmertová (Gar.) | Z,ZK | 5 | 2P+2S | Z,L | V |
| B0M16HSD1 | History of economy and social studies Marcela Efmertová | Z,ZK | 5 | 2P+2S | Z,L | V |
| B0M16PSM | Psychology Jan Fiala Jan Fiala Jan Fiala (Gar.) | Z,ZK | 5 | 2P+2S | Z,L | V |
| B0M16TEO | Theology Vladimír Sláme ka Vladimír Sláme ka (Gar.) | Z,ZK | 5 | 2P+2S | Z,L | V |

Characteristics of the courses of this group of Study Plan: Code=2018_MBIOH Name=Humanities subjects

| B0M16FIL | | Z,ZK | 5 |
|----------------------------|--|----------------------|-------------------|
| B0M16HVT | History of science and technology 2 | Z,ZK | 5 |
| This subject traces histe | orical developments in electrical engineering branches in the world and in the Czech Lands. Its ultimate goal is to stimulate s | tudents' interest in | the history and |
| traditions of the subject | , while highlighting the developments in technical education and professional organizations, the process of shaping scientific | life and the influe | nce of technical |
| engineers | | | |
| B0M16HSD1 | History of economy and social studies | Z,ZK | 5 |
| This subject deals with | the history of the Czech society in the 19th - 21th centuries. It follows the forming of the Czech political representation, its air | ns and achieved r | esults as well as |
| the social and cultural of | levelopment and coexistence of the various ethnical groups in the Czech countries. | | |
| B0M16PSM | Psychology | Z,ZK | 5 |

Theology B0M16TEO

This subject provides to students the basic orientation in christian theology and requires no special previous education. After short philosophic lecture the basic theologic disciplines are gone through. The subject is determined not only to believer students who want to know the reliable theologic grounding but also above all to ones who want to get know Christianity - religion from which graws our civilization up.

Code of the group: 2018_MBIOVOL Name of the group: Elective subjects Requirement credits in the group: Requirement courses in the group:

Credits in the group: 0

Note on the group:

B4M36MBG

~Nabídku volitelných předmětů uspořádaných podle kateder najdete na webových stránkách http://www.fel.cvut.cz/cz/education/volitelne-predmety.html\\

| Code | Name of the course | Completion | Credits |
|--|--|--|--|
| B0M16FIL | | Z,ZK | 5 |
| B0M16HSD1 | History of economy and social studies | Z,ZK | 5 |
| | with the history of the Czech society in the 19th - 21th centuries. It follows the forming of the Czech political representation, its aims a | | |
| | the social and cultural development and coexistence of the various ethnical groups in the Czech countries. | | |
| B0M16HVT | History of science and technology 2 | Z,ZK | 5 |
| | historical developments in electrical engineering branches in the world and in the Czech Lands. Its ultimate goal is to stimulate stude | | |
| traditions of the sub | bject, while highlighting the developments in technical education and professional organizations, the process of shaping scientific life | and the influence | of technical |
| | engineers | | |
| B0M16PSM | Psychology | Z,ZK | 5 |
| B0M16TEO | Theology | Z,ZK | 5 |
| This subject provid | les to students the basic orientation in christian theology and requires no special previous education. After short philosophic lecture is | the basic theologic | disciplines |
| are gone through. T | he subject is determined not only to believer students who want to know the reliable theologic grounding but also above all to ones wh | o want to get know | Christianity |
| | - religion from which graws our civilization up. | | |
| B0M37FAV | Physiology and modeling of hearing and vision | Z.ZK | 6 |
| The primary aim of | the course is to study the physiology of sensors and processes of perception of audio and visual information by human subjects as t | wo central and mo | st importan |
| | annels, i.e., Human Auditory System (HAS) and Human Visual System (HVS). The course summarizes current knowledge in the field | | - |
| | the same time, presents their description using mathematical models using the latest computational tools and procedures, including | | • |
| | | | |
| Learning (DL) and i | | dication area is the | audiovisua |
| toohnology rolated t | Artificial Intelligence (AI). Emphasis is also placed on current and prospective applications of the mentioned knowledge. The main applications of the mentioned knowledge. The main applications of the property of the applications are provided to the property of the applications of the property of the property of the applications of the applications of the applications of the property of the applications of the appl | | |
| | to human perception, but the direct employment of the acquired knowledge also includes the areas of multimedia technology, control | systems, automation | on, robotics |
| safety and securit | to human perception, but the direct employment of the acquired knowledge also includes the areas of multimedia technology, control ty technology, bioinspired systems, etc. At the same time, students gain a general overview of information processing in biological sy | systems, automationstics stems. A separate | on, robotics part is the |
| safety and securit objectification of a | to human perception, but the direct employment of the acquired knowledge also includes the areas of multimedia technology, control ty technology, bioinspired systems, etc. At the same time, students gain a general overview of information processing in biological sy udiovisual information perceived quality, i.e., Quality of Experience (QoE). The course is intended for students of master's degree in the course is intended for students of master's degree. | systems, automationstices stems. A separate sechnical fields. The | on, robotics part is the e exercises |
| safety and securit objectification of a | to human perception, but the direct employment of the acquired knowledge also includes the areas of multimedia technology, control ty technology, bioinspired systems, etc. At the same time, students gain a general overview of information processing in biological sy udiovisual information perceived quality, i.e., Quality of Experience (QoE). The course is intended for students of master's degree in fundamental experiments to determine the most important characteristics of HAS and HVS, including computational models and sim | systems, automationstices stems. A separate sechnical fields. The | on, robotics part is the e exercises |
| safety and securit objectification of a will be devoted to | to human perception, but the direct employment of the acquired knowledge also includes the areas of multimedia technology, control ty technology, bioinspired systems, etc. At the same time, students gain a general overview of information processing in biological sy udiovisual information perceived quality, i.e., Quality of Experience (QoE). The course is intended for students of master's degree in t fundamental experiments to determine the most important characteristics of HAS and HVS, including computational models and simprocesses. | systems, automationstems. A separate sechnical fields. The nulation of vision and | on, robotics part is the e exercises nd hearing |
| safety and securit objectification of a will be devoted to B2M31AEDA | to human perception, but the direct employment of the acquired knowledge also includes the areas of multimedia technology, control ty technology, bioinspired systems, etc. At the same time, students gain a general overview of information processing in biological sy udiovisual information perceived quality, i.e., Quality of Experience (QoE). The course is intended for students of master's degree in the fundamental experiments to determine the most important characteristics of HAS and HVS, including computational models and simprocesses. Experimental Data Analysis | systems, automatic stems. A separate technical fields. The nulation of vision an | on, robotics part is the e exercises nd hearing |
| safety and securit objectification of an will be devoted to B2M31AEDA In the course of s | to human perception, but the direct employment of the acquired knowledge also includes the areas of multimedia technology, control ty technology, bioinspired systems, etc. At the same time, students gain a general overview of information processing in biological sy udiovisual information perceived quality, i.e., Quality of Experience (QoE). The course is intended for students of master's degree in the fundamental experiments to determine the most important characteristics of HAS and HVS, including computational models and simprocesses. Experimental Data Analysis subject "Experimental Data Analysis", students will acquire knowledge regarding fundamental methods for data analysis and machine | systems, automatic stems. A separate technical fields. The nulation of vision an Z,ZK e learning for evalu | on, robotics part is the exercises and hearing 6 lation and |
| safety and securit objectification of an will be devoted to B2M31AEDA In the course of sinterpretation of dat | to human perception, but the direct employment of the acquired knowledge also includes the areas of multimedia technology, control ty technology, bioinspired systems, etc. At the same time, students gain a general overview of information processing in biological sy udiovisual information perceived quality, i.e., Quality of Experience (QoE). The course is intended for students of master's degree in the fundamental experiments to determine the most important characteristics of HAS and HVS, including computational models and simprocesses. Experimental Data Analysis subject "Experimental Data Analysis", students will acquire knowledge regarding fundamental methods for data analysis and machineta. In the course of practical lectures, students will solve individual tasks using real data from signal processing in neuroscience research. | systems, automatic stems. A separate technical fields. The nulation of vision and Z,ZK elearning for evaluation. In the course of | on, robotics part is the e exercises and hearing 6 action and of semestra |
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Molecular Biology and Genetics

Z,ZK

| B4M36SAN | Statistical Data Analysis | Z,ZK | 6 |
|---------------------------------------|--|---------------------------------------|---------------|
| | n the skills developed in introductory statistics courses. It is practically oriented and gives an introduction to applied statistics. It mainly | | 1 |
| analysis and modelli | ing, i.e., the methods that help to understand, interpret, visualize and model potentially high-dimensional data. It can be seen as a p | urely statistical co | ounterpart to |
| | machine learning and data mining courses. | | |
| B4M36SMU | Symbolic Machine Learning | Z,ZK | 6 |
| This course consis | sts of four parts. The first part of the course will explain methods through which an intelligent agent can learn by interacting with its e | environment, also | known as |
| | rning. This will include deep reinforcement learning. The second part focuses on Bayesian networks, specifically methods for inferen | · · · · · · · · · · · · · · · · · · · | |
| fundamental topics | s from natural language learning, starting from the basics and ending with state-of-the-art architectures such as transformer. Finally, | the last part will p | provide an |
| | introduction to several topics from the computational learning theory, including the online and batch learning settings. | | |
| BAM02BIO | Biosensors | Z,ZK | 6 |
| BAM02FPT | Physics for Diagnostics and Therapy | Z,ZK | 6 |
| | nts will be introduced to the problems of locomotive organs diseases and musculoskeletal pain in the first seven lectures. Great space is | | |
| - | utic ultrasound and phototherapy. Furthermore, advanced neurorehabilitation methods, especially transcranial brain stimulation methods. | | |
| - | of the brain - rTMS, transcranial electrical stimulation of the brain - tDCS and electroconvulsive therapy - ECT) are discussed. In the | | ne semester, |
| | on is paid to the possibilities of using ionizing electromagnetic fields in medical diagnostics and therapy (eg X-ray, proton therapy, rac | | 6 |
| BAM17EMC | Introduction to electromagnetic compatibility | Z,ZK | 6 |
| The subject dwells | s on problems of electromagnetic compatibility. Students obtain the basic knowledges in the field of electromagnetic compatibility - el susceptibility and testing methods. The subject leads to gain professional skills in the field of electrical engineering. | lectromagnetic int | terrerence, |
| DAM17EDM | | Z,ZK | 6 |
| BAM17EPM | Applications of Electromagnetic Fields in Medicine se lectures is to give to students a basic overview of biophysical aspects of EM fields in different biological systems, including an overv | | 6 |
| · · · · · · · · · · · · · · · · · · · | limits, clinical usage of EM field effects on biological systems, microwave hyperthermia, measurement of dielectric parameters of bio | | |
| in medicine. Salety i | of mobile phone users, magnetic resonance imaging, interaction of optical radiation with biological tissue. | nogical tissues, L | ivi exposure |
| BAM31ADA | Adaptive signal processing | Z,ZK | 6 |
| DAMO TADA | This course provides a basic discourse on adaptive algorithms for filtering, decorrelation, separation and beamforming. | ۷,۷۱۲ | 0 |
| BAM31AOL | Applied optoelectronics in medicine | Z,ZK | 6 |
| BAM31BSG | | Z,ZK | 6 |
| | Biological signals | | _ |
| BAM31LET | Medical Instrumentation and Devices | Z,ZK | 6 |
| = | undamental principles applied within the modern medical devices and systems, esp. from the point of view of functional blocks and ele- medical equipments including electrocardiographs, electroencephalographs, bedside and central monitors, equipments for anestesi | | - |
| • | nents for clinical laboratory, electrostimulators, cardiostimulators and defibrilators, blood pressure and flow measurement (including of | | |
| BAM31MOA | Modeling and analysis of brain activity | Z,ZK | 6 |
| BAM31NPG | Neurophysiology | Z,ZK | 6 |
| | · · · · · · · · · · · · · · · · · · · | | |
| BAM31ZAS | Analog Signal Processing | Z,ZK | 6 |
| | h analog input-output blocks for signal transmission and processing. They discussed circuit solution of amplifiers and filters, including the | | |
| | . Students learn the circuit concepts and possibilities for solving the contemporary analogue structures. The second part of the cours ion of analog filters, including discrete-time circuits. The conclusion is devoted to the possibilities of computer optimization of electro | | - |
| BAM33NIN | Neuroinformatics | Z,ZK | 6 |
| 1 | ן s Course concentrates on modelling of neurons, stochastic learning on cellular level, information coding and decoding in brain and sin | , | 1 |
| The Nearonnormano. | from clinical practices are provided throughout the course. The labs focus on signal neuron analysis from human and animal bit | - ' | ig. Examples |
| BAM33ZMO | Medical Image Processing | Z,ZK | 6 |
| | the most used advanced image analysis methods, with emphasis on images from medical and biological modalities, from microscopy | | - |
| | including time sequences. | sy, to amaccana, | , 0. 0 ., |
| BAM33ZSL | Medical Imaging Systems | Z,ZK | 6 |
| I . | ne principles, design and properties of currently used medical imaging devices. We shall deal with 2D microscopic, X-ray and ultrasou | | 1 |
| | h as Doppler ultrasound. We will also study tomographic (3D) imaging systems: computed tomography (CT), magnetic resonance imaging | | _ |
| · | MRI (fMRI) and nuclear imaging methods (PET,SPECT). For more information see https://cw.fel.cvut.cz/wiki/courses/zsl | <i>5</i> | J |
| BAM36BIN | Bioinformatics | Z,ZK | 6 |
| BAM38KLS | Construction of Medical Systems | Z,ZK | 6 |
| BDIP30 | Diploma Thesis | Z | 30 |
| | ا omprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or h | <u> </u> | 1 |
| • | brighteries work for the master's degree study programme. A student will choose a topic from a range of topics related to his or his properties of the board of examiners for the comprehensing the comprehensive many programmers. | | - |
| BE4M33SSU | Statistical Machine Learning | Z,ZK | 6 |
| | al machine learning is to develop systems (models and algorithms) for learning to solve tasks given a set of examples and some price | | |
| | | | |

This includes typical tasks in speech and image recognition. The course has the following two main objectives 1. to present fundamental learning concepts such as risk minimisation, maximum likelihood estimation and Bayesian learning including their theoretical aspects, 2. to consider important state-of-the-art models for classification and regression and to show

how they can be learned by those concepts.

BMPROJ6 Diploma Project Z 6

For updated information see http://bilakniha.cvut.cz/en/f3.html Generated: day 2025-07-20, time 07:03.